



**Explanation of Significant Differences
2013 Record of Decision Cleanup Levels**

**Lockheed West Seattle Superfund Site
Seattle, WA**

**CERCLIS ID Number: WAN001002655
February 2015**

Issued By:

Cami Grandinetti

Cami Grandinetti

2/12/15

Date

Program Manager
Remedial Cleanup Program
Office of Environmental Cleanup
U.S. EPA Region 10

Introduction to the Site and Statement of Purpose

This decision document presents an Explanation of Significant Differences (ESD) regarding Cleanup Levels for the Lockheed West Seattle Superfund Site (Lockheed West Site or Site), Seattle, Washington, #WAN001002655. The Record of Decision (ROD) addressed by this ESD was signed on August 28, 2013 and sets forth the Final Remedial Action at the Site.

The ROD addresses the in-waterway portion of the Lockheed West Site of what was formerly known as the Lockheed Shipyard No.2, located near the confluence of the West Waterway and Elliott Bay, west of the city of Seattle, Washington. The 40-acre Lockheed West Site includes the in-water marine sediments where the former Lockheed Shipyard No. 2 was located (the shipway and dry docks were located in the water over the sediments). It is impacted by tides with additional influence from the Lower Duwamish Waterway (LDW) that flows into the West Waterway. The Site also includes a narrow shoreline bank and intertidal sediments along the northern and eastern shorelines, and subtidal sediments that extend from minus (-) 40 to -50 feet mean lower low water (MLLW) in historically dredged areas. Numerous pilings remain within the footprint of the former shipway and pier structures in the northwestern portion of the Site. Analytical data from the surface and subsurface sediment samples show that metals, polychlorinated biphenyls (PCBs), tributyltin (TBT), and polycyclic aromatic hydrocarbons (PAHs) are the most frequently detected compounds in the cleanup area.

The Remedial Action Objectives (RAOs) for the Lockheed West Site, listed in Section 2.9.1 of the ROD, are descriptions of what the remedial action is expected to accomplish. The RAOs are intended to address the risks posed to human health and the environment, as follows:

- Human Health Risks:
 - RAO 1 – Reduce human health risks associated with the consumption of resident seafood by adults and children with the highest potential exposure.
 - RAO 2 – Prevent human health risks from direct exposure (skin contact and incidental ingestion) to contaminated sediments during netfishing, clamming and beach play.
- Ecological Risks:
 - RAO 3 – Prevent risks to benthic invertebrates from exposure to contaminated sediments.
 - RAO 4 – Prevent risks to crabs, fish and birds from exposure to contaminated sediments.

The Cleanup Levels for contaminants of concern (COC) associated with these RAOs are also identified in the ROD. The Cleanup Levels represent site-specific concentration limits that are protective of human health and the environment and provide the basis for meeting the specific Site RAOs. These Cleanup Levels and methods for demonstrating compliance are listed in Tables 12 and 23 of the ROD.

In May 2014, the EPA recognized that Tables 12 and 23 contained several errors, which necessitated preparation of this ESD. These errors include:

1. The units for certain COCs (PCBs, phthalates, and PAHs) were inadvertently listed as micrograms per kilogram organic carbon (ug/kg – OC) instead of milligrams per kilogram organic carbon (mg/kg – OC).

2. The references for the Cleanup Levels for certain COCs were not cited correctly.
3. The spatial scale of exposure, or compliance basis, was mistakenly listed as "Sitewide" should have been listed as "Subtidal."

These errors have been corrected in Tables 1 and 2, which serve as replacements for Tables 12 and 23, respectively, in the ROD. The marked-up tables in Attachment 1 show the difference between the values in Tables 1 and 2 and the values in the ROD tables.

This ESD is issued in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) 42 U.S.C. Section 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 C.F.R Section 300.435(c)(2)(i). The Lockheed Martin Corporation (Lockheed) is the Potentially Responsibility Party and the U.S. Environmental Protection Agency (EPA) is the lead regulatory agency.

In accordance with 40 C.F. R. Section 300.825(a)(2), this ESD and supporting documents will become part of the Administrative Record file for the Site. The Administrative Record is available for review at the U.S. EPA Region 10 Superfund Records Center, 1200 Sixth Avenue, Seattle, WA 98101 (please call 206-553-4494 for an appointment).

Site History, Contamination, and Selected Remedy

The Site was placed on the National Priorities List on March 7, 2007. Prior to this, the Site (then referred to as Lockheed Shipyard No. 2) was listed as a sediment cleanup priority project under State of Washington authority through the requirements of the Model Toxics Control Act (MTCA). Since 1984, an extensive series of studies have been independently conducted by Lockheed Martin and the Port of Seattle (Port) in an effort to determine the nature and extent of sediment contamination at the Site. Much of this information was compiled by Parametrix (1994a and b) and by Enviro (1990) to support characterization of the Lockheed Shipyard No. 2 site as part of harbor development planning by the Port. Available historical sediment quality information in the vicinity of the Site includes samples collected prior to 1998 and in 2003 as part of a due diligence investigation (Hart Crowser, 2003).

Basis of ESD and Description of Significant Difference from ROD

The 2013 ROD established Cleanup Levels for all of the contaminants of concern at the Site (Tables 12 and 23). When Special Notice Letter negotiations regarding the liability began in the spring 2014, Lockheed Martin, the Potentially Responsible Party (PRP), identified that some of the units were incorrectly stated and that the references for some Cleanup Levels were mistakenly attributed to Washington State Sediment Management Standards (SMS). Additional information about the errors and the basis for making changes to the Cleanup Levels listed in the ROD is provided below:

- **Units** - The standards set in a ROD are based on local, state or federal applicable, relevant and appropriate requirements and criteria (ARARs) which are codified by statute. For example, the Washington State's SMS are the ARAR for protection of benthic invertebrates (which is RAO 3 in the ROD). The SMS require that the cleanup levels for COCs in sediment preferably meet the lowest of the applicable benchmarks for benthic invertebrates where

possible. These benchmarks are the Sediment Quality Standards (SQS), which are listed in Table III of Washington Administrative Code (WAC) 173-204-562. This table lists the SQS values in mg/kg and mg/kg-OC. However, when the values were transcribed to ROD Tables 12 and 23, the units for some COCs (PCBs, phthalates, and PAHs) were inadvertently listed as ug/kg-OC. For example, the SQS value for PCBs is 12 mg/kg-OC. However, on Tables 12 and 23 in the ROD, the units are mis-reported as 12 ug/kg-OC. Because these concentrations are based on ARARs, and meeting ARARs is a Threshold Criterion under CERCLA, it is allowable to modify the Cleanup Level tables in the ROD to accurately state the cleanup standards governed by the ARARs.

- **References for Cleanup Levels** – In addition to the Cleanup Level values, Tables 12 and 23 of the ROD list the references for the values. In the case of antimony, cobalt, nickel, selenium, and vanadium, the source of the RAO 3 Cleanup Level values is listed as “SQS”. However, Table III of WAC 173-204-562 does not include SQS values for these metals. The actual sources of the RAO 3 Cleanup Levels for these metals are the lowest apparent effects threshold (LAET) screening levels, which are based on the same levels of protection for benthic invertebrates as the SQS, but are not codified by statute. Also, Tables 12 and 23 of the ROD list the sources of the RAO 1 and 2 Cleanup Levels for cadmium as being the risk-based threshold concentration (RBTC) for human exposure. However, the listed value (0.398 mg/kg dry weight) is actually the natural background concentration¹ rather than the RBTC.

These errors have been corrected in Tables 1 and 2, which serve as replacements for Tables 12 and 23, respectively, in the ROD. The marked-up tables in Attachment 1 show the difference between the values in Tables 1 and 2 and the values in the ROD tables.

Support Agency Acceptance

The Washington Department of Ecology (Ecology) has reviewed and accepted these modifications to the Cleanup Level tables and the Figure for the Remedy Selected.

Statutory Determinations

The remedy for the Site, as modified by this ESD, continues to satisfy the statutory requirements of CERCLA Section 121, 43 U.S.C. 9621 to protect human health and the environment, comply with federal and state requirements that are applicable or relevant and appropriate to the remedial action, area cost-effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

Public Participation Compliance

The public participation requirements set out in the NCP, 40 C.F.R. Section 300.435(c)(2), have been met by adding the ESD and supporting information to the administrative record established under Section 300.815 and making it available to the public on EPA’s website and in the Administrative Record located at the Superfund Records Center, Seattle, WA 98101. The phone number is 206-553-

¹ Consistent with federal and state ARARs, natural background may be used as the Cleanup Level when it is higher than the RBTCs.

4494. In addition, when the ESD is issued, a public notice of its availability will be published in the Seattle Times.

TABLE 1 (REPLACES TABLE 12)
Summary of Cleanup Levels for COCs in Sediment (Page 1 of 4)

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^b	RAO 1 Human Seafood Consumption ^c (0 to 10 cm)	RAO 2 Human Direct Contact ^c (0 to 45 cm)	RAO 3 Benthic Organisms ^d (0 to 10 cm)	RAO 4 Ecological ^e (0 to 10 cm)
Total PCBs	Yes	µg/kg dw	Subtidal	2 (nat. bkgd)	n/a	n/a	100 (RBTC – fish)
			Intertidal	2 (nat. bkgd)	n/a	n/a	n/a
			Point	n/a	n/a	12 mg/kg OC/ 180 (SQS)	n/a
cPAHs	Yes	µg TEQ/kg dw	Subtidal	9 (nat. bkgd)	550 (RBTC) ^f	n/a	n/a
			Intertidal	9 (nat. bkgd)	15 (RBTC) ^g	n/a	n/a
			Point	n/a	n/a	n/a	n/a
Arsenic	Yes	mg/kg dw	Subtidal	7 (nat. bkgd)	7 (nat. bkgd)	n/a	n/a
			Intertidal	7 (nat. bkgd)	7 (nat. bkgd)	n/a	n/a
			Point	n/a	n/a	57 (SQS)	n/a
Lead	Yes	mg/kg dw	Subtidal	11 (nat. bkgd)	n/a	n/a	n/a
			Intertidal	11 (nat. bkgd)	n/a	n/a	50 (RBTC – sandiper)
			Point	n/a	n/a	n/a	n/a
Tributyltin	Yes	µg/kg dw	Subtidal	430 (RBTC – child)	n/a	n/a	150 (RBTC – fish)
			Intertidal	2,000 (RBTC – child) ^h	n/a	n/a	n/a
			Point	n/a	n/a	n/a	n/a
Copper	Yes	mg/kg dw	Subtidal	400 (RBTC – child)	n/a	n/a	114 (RBTC – fish)
			Intertidal	400 (RBTC – child) ^h	n/a	n/a	420 (RBTC – sandiper)
			Point	n/a	n/a	390 (SQS/CSL)	n/a
Mercury	Yes	mg/kg dw	Subtidal	0.41 (RBTC – child)	n/a	n/a	n/a
			Intertidal	0.17 (RBTC – child)	n/a	n/a	n/a
			Point	n/a	n/a	0.41 (SQS)	n/a
Dioxins/ Furans	Yes	ng TEQ/kg dw	Subtidal	2 (nat. bkgd)	37 (RBTC ^h)	n/a	n/a
			Intertidal	2 (nat. bkgd)	13 (RBTC ^h)	n/a	n/a
			Point	n/a	n/a	n/a	n/a

TABLE 1 (REPLACES TABLE 12)
Summary of Cleanup Levels for COCs in Sediment (Page 2 of 4)

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^b	RAO 1 Human Seafood Consumption ^c (0 to 10 cm)	RAO 2 Human Direct Contact ^c (0 to 45 cm)	RAO 3 Benthic Organisms ^d (0 to 10 cm)	RAO 4 Ecological ^e (0 to 10 cm)
Antimony	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	150 (LAET/SL)	n/a
Cadmium	No	mg/kg dw	Subtidal	0.398 (nat. bkgd)	n/a	n/a	n/a
			Intertidal	0.398 (nat. bkgd)	n/a	n/a	n/a
			Point	n/a	n/a	n/a	n/a
Chromium	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	260 (SQS)	n/a
Cobalt	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	10 (LAET/SL)	n/a
Nickel	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	140 (LAET/SL)	n/a
Selenium	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	1 (LAET/SL)	n/a
Vanadium	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	57 (LAET/SL)	n/a
Zinc	No	mg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	410 (SQS)	n/a
Pentachloro-phenol	No	µg/kg dw	Subtidal	58 mg/kg dw (RBTC)	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	360 (SQS)	n/a
Bis(2-ethylhexyl)-phthalate	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	47 mg/kg-OC 710 (SQS)	n/a
Acenaphthene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	16 mg/kg-OC/ 240 (SQS)	n/a

TABLE 1 (REPLACES TABLE 12)
Summary of Cleanup Levels for COCs in Sediment (Page 3 of 4)

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^b	RAO 1 Human Seafood Consumption ^c (0 to 10 cm)	RAO 2 Human Direct Contact ^c (0 to 45 cm)	RAO 3 Benthic Organisms ^d (0 to 10 cm)	RAO 4 Ecological ^e (0 to 10 cm)
Benzo(a)-anthracene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	110 mg/kg-OC/ 1,700 (SQS)	n/a
Benzo(a)pyrene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	99 mg/kg-OC/ 1,500 (SQS)	n/a
Benzo(g,h,i)-perylene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	31 mg/kg-OC/ 470 (SQS)	n/a
Total Benzofluor-anthenes	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	230 mg/kg-OC/ 1,800 (SQS)	n/a
Chrysene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	110 mg/kg-OC/ 1,700 (SQS)	n/a
Dibenz(a,h)-anthracene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	12 mg/kg-OC/ 180 (SQS)	n/a
Fluoranthene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	160 mg/kg-OC/ 2,400 (SQS)	n/a

TABLE 1 (REPLACES TABLE 12)
Summary of Cleanup Levels for COCs in Sediment (Page 4 of 4)

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^b	RAO 1 Human Seafood Consumption ^c (0 to 10 cm)	RAO 2 Human Direct Contact ^c (0 to 45 cm)	RAO 3 Benthic Organisms ^d (0 to 10 cm)	RAO 4 Ecological ^e (0 to 10 cm)
Indeno(1,2,3-cd)pyrene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	34 mg/kg-OC/ 510 (SQS)	n/a
Phenanthrene	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	100 mg/kg-OC/ 1,500 (SQS)	n/a
Total HPAH	No	µg/kg dw	Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	960 mg/kg-OC/ 14,400 (SQS)	n/a

^a Unless noted differently in RAO-specific values

^b The spatial scale of exposure is measured as sitewide (i.e., all subtidal and intertidal sediments), intertidal sediments only, and point measurements at single locations throughout the site (i.e., all subtidal and intertidal sediment locations) or at single locations in intertidal sediment only. The spatial scale is RAO-specific, with sitewide exposures applicable to human seafood consumption, human direct contact, and exposures of fish and crab. Intertidal-only exposures are applicable to human consumption of clams from intertidal areas and exposures of sandpiper. Point exposures are applicable to benthic organisms, which are evaluated at single station locations. The statistical metric for sitewide and intertidal evaluation of alternatives and compliance monitoring is the upper confidence limit on the mean, whereas point exposures are evaluated with concentration data at single locations.

^c Cleanup levels are based on 10⁻⁶ cancer risk for carcinogens (e.g., PCBs, cPAHs, arsenic) or on a child exposure hazard quotient of 1 for noncarcinogens (lead, tributyltin, copper). Where Cleanup Levels are based on carcinogenic risks below background, the background concentration is selected; where no background values are available (chlordanes and DDT), the method detection limit (MDL) is selected.

^d Applicable on a point exposure only. Values for PCBs and PAHs (except total benzofluoranthenes) are the organic carbon-normalized SQS and the dry weight equivalent based on an average sediment TOC content of 1.5%; for all other compounds values are dry weight. Under the SMS, sediment cleanup standards are established on a site-specific basis within an allowable range. The SQS and CSL define this range. For chemicals without SMS, LAET and 2LAET values or the SL and ML of the DMMP define this range.

^e Cleanup levels for sitewide exposure are the lowest for either fish or crab; Cleanup levels for intertidal exposure are for sandpiper

n/a = compounds do not present a risk for the RAO scenario.

mg/kg dw = milligrams per kilogram dry weight

mg/kg-OC = milligrams per kilogram organic carbon

µg/kg dw = micrograms per kilogram dry weight

ng TEQ/kg dw = nanograms toxicity equivalents per kilogram dry weight

µg TEQ/kg dw = micrograms Toxicity Equivalents per kilogram dry weight

OC = Organic Carbon (1.5%)

Adapted from RI/FS Report Table 9-5 (TetraTech 2012)

TABLE 2 (REPLACES TABLE 23)
Summary of Compliance Zones and Cleanup Levels for COCs

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Total PCBs	Yes	Subtidal	0 to 10 cm	2	µg/kg dw	Natural background
		Intertidal	0 to 45 cm	2	µg/kg dw	Natural background
		Point	0 to 10 cm	12 180	mg/kg OC µg/kg dw	SQS
cPAHs	Yes	Subtidal	0 to 10 cm	9	µg TEQ/kg dw	Natural background
		Intertidal	0 to 45 cm	9	µg TEQ/kg dw	Natural background
		Point	0 to 10 cm	-		
Arsenic	Yes	Subtidal	0 to 10 cm	7	mg/kg dw	Natural background
		Intertidal	0 to 45 cm	7	mg/kg dw	Natural background
		Point	0 to 10 cm	57	mg/kg dw	SQS
Lead	Yes	Subtidal	0 to 10 cm	11	mg/kg dw	Natural background
		Intertidal	0 to 45 cm	11	mg/kg dw	Natural background
		Point	0 to 10 cm	-		
Tributyltin	Yes	Subtidal	0 to 10 cm	150	mg/kg dw	RBTC – fish
		Intertidal	0 to 45 cm	2,000	mg/kg dw	RBTC – child
		Point	0 to 10 cm	-		
Copper	Yes	Subtidal	0 to 10 cm	400	mg/kg dw	RBTC – child
		Intertidal	0 to 45 cm	400	mg/kg dw	RBTC – child
		Point	0 to 10 cm	390	mg/kg dw	SQS and CSL
Mercury	Yes	Subtidal	0 to 10 cm	0.41	mg/kg dw	RBTC – child
		Intertidal	0 to 45 cm	0.17	mg/kg dw	RBTC – child
		Point	0 to 10 cm	0.41	mg/kg dw	SQS
Dioxins/Furans	Yes	Subtidal	0 to 10 cm	2	ng TEQ/kg dw	Natural background
		Intertidal	0 to 45 cm	2	ng TEQ/kg dw	Natural background
		Point	0 to 10 cm	-		
Antimony	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	150	mg/kg dw	LAET/SL

TABLE 2 (REPLACES TABLE 23)

Summary of Compliance Zones and Cleanup Levels for COCs

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Cadmium	No	Subtidal	0 to 10 cm	0.398	mg/kg dw	Natural Background
		Intertidal	0 to 45 cm	0.398	mg/kg dw	Natural Background
		Point	0 to 10 cm	-		
Chromium	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	260	mg/kg dw	SQS
Cobalt	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	10	mg/kg dw	LAET/SL
Nickel	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	140	mg/kg dw	LAET/SL
Selenium	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	1	mg/kg dw	LAET/SL
Vanadium	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	57	mg/kg dw	LAET/SL
Zinc	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	410	mg/kg dw	SQS
Pentachlorophenol	No	Subtidal	0 to 10 cm	58	mg/kg dw	RBTC
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	360	µg/kg dw	SQS
Bis(2-ethylhexyl)-phthalate	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	47 710	mg/kg OC µg/kg dw	SQS

TABLE 2 (REPLACES TABLE 23)
Summary of Compliance Zones and Cleanup Levels for COCs

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Acenaphthene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	16 240	mg/kg OC µg/kg dw	SQS
Benzo(a)-anthracene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	110 1,700	mg/kg OC µg/kg dw	SQS
Benzo(a)pyrene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	99 1,500	mg/kg OC µg/kg dw	SQS
Benzo(g,h,i)-perylene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	31 470	mg/kg OC µg/kg dw	SQS
Total Benzofluor-anthenes	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	230 1,800	mg/kg OC µg/kg dw	SQS
Chrysene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	110 1,700	mg/kg OC µg/kg dw	SQS
Dibenz(a,h)-anthracene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	12 180	mg/kg OC µg/kg dw	SQS
Fluoranthene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	160 2,400	mg/kg OC µg/kg dw	SQS

TABLE 2 (REPLACES TABLE 23)

Summary of Compliance Zones and Cleanup Levels for COCs

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Indeno(1,2,3-cd)pyrene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	34 510	mg/kg OC µg/kg dw	SQS
Phenanthrene	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	100 1,500	mg/kg OC µg/kg dw	SQS
Total HPAH	No	Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	960 14,400	mg/kg OC µg/kg dw	SQS

Notes:

- not a COC for compliance zone
 cm = centimeter
 cPAHs = carcinogenic polycyclic aromatic hydrocarbons
 CSL = cleanup screening level
 LAET/SL = lowest apparent effects threshold/screening level
 Nat Bkgd = natural background
 PCBs = polychlorinated biphenyls
 RAO = remedial action objective
 RBTC = risk based threshold concentration
 SQS = sediment quality standard
 SWAC = spatially-weighted average concentration
 mg/kg dw = milligrams per kilogram dry weight
 µg/kg dw = micrograms per kilogram dry weight
 ng TEQ/kg dw = nanograms toxicity equivalents per kilogram dry weight
 µg TEQ/kg dw = micrograms Toxicity Equivalents per kilogram dry weight
 OC = Organic Carbon (1.5%)

Attachment 1
Changes to ROD Tables 12 and 23

TABLE 12 (MARK-UP)

Summary of Cleanup Levels for COCs in Sediment (Page 1 of 4)

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^{ab}	RAO 1 Human Seafood Consumption ^{bc} (0 to 10 cm)	RAO 2 Human Direct Contact ^{bc} (0 to 45 cm)	RAO 3 Benthic Organisms ^{cd} (0 to 10 cm)	RAO 4 Ecological ^{de} (0 to 10 cm)
Total PCBs	Yes	µg/kg dw	Sitewide	2 (nat. bkgd)	n/a	n/a	100 (RBTC – fish)
			Subtidal	2 (nat. bkgd)	n/a	n/a	n/a
			Point	n/a	n/a	12 mg/kg OC/ 180 (dw) (SQS)	n/a
cPAHs	Yes	µg TEQ/kg dw	Sitewide	9 (nat. bkgd)	550 (RBTC) ^f	n/a	n/a
			Subtidal	9 (nat. bkgd)	15 (RBTC) ^g	n/a	n/a
			Point	n/a	n/a	n/a	n/a
Arsenic	Yes	mg/kg dw	Sitewide	7 (nat. bkgd)	7 (nat. bkgd)	n/a	n/a
			Subtidal	7 (nat. bkgd)	7 (nat. bkgd)	n/a	n/a
			Point	n/a	n/a	57 (SQS)	n/a
Lead	Yes	mg/kg dw	Sitewide	11 (nat. bkgd)	n/a	n/a	n/a
			Subtidal	11 (nat. bkgd)	n/a	n/a	50 (RBTC – sandiper)
			Point	n/a	n/a	n/a	n/a
Tributyltin	Yes	µg/kg dw	Sitewide	430 (RBTC – child)	n/a	n/a	150 (RBTC – fish)
			Subtidal	2,000 (RBTC – child) ^h	n/a	n/a	n/a
			Point	n/a	n/a	n/a	n/a
Copper	Yes	mg/kg dw	Sitewide	400 (RBTC – child)	n/a	n/a	114 (RBTC – fish)
			Subtidal	400 (RBTC – child) ^h	n/a	n/a	420 (RBTC – sandiper)
			Point	n/a	n/a	390 (SQS/CSL)	n/a
Mercury	Yes	mg/kg dw	Sitewide	0.41 (RBTC – child)	n/a	n/a	n/a
			Subtidal	0.17 (RBTC – child)	n/a	n/a	n/a
			Point	n/a	n/a	0.41 (SQS)	n/a
Dioxins/ Furans	Yes	ng TEQ/kg dw	Sitewide	2 (nat. bkgd)	37 (RBTC) ^h	n/a	n/a
			Subtidal	2 (nat. bkgd)	13 (RBTC) ^h	n/a	n/a
			Point	n/a	n/a	n/a	n/a

TABLE 12 (MARK UP)

Summary of Cleanup Levels for COCs in Sediment (Page 2 of 4)

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^{ab}	RAO 1 Human Seafood Consumption ^{b c} (0 to 10 cm)	RAO 2 Human Direct Contact ^{b c} (0 to 45 cm)	RAO 3 Benthic Organisms ^{c d} (0 to 10 cm)	RAO 4 Ecological ^{d e} (0 to 10 cm)
Antimony	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	150 (SQS LAET/SL)	n/a
Cadmium	No	mg/kg dw	Sitewide	0.398 (RBTC-nat. bkgd)	n/a	n/a	n/a
			Subtidal	0.398 (RBTC-nat. bkgd)	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
Chromium	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	260 (SQS)	n/a
Cobalt	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	10 (SQS LAET/SL)	n/a
Nickel	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	140 (SQS LAET/SL)	n/a
Selenium	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	1 (SQS LAET/SL)	n/a
Vanadium	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	57 (SQS LAET/SL)	n/a
Zinc	No	mg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	410 (SQS)	n/a
Pentachloro-phenol	No	µg/kg dw	Sitewide	58 mg/kg dw (RBTC)	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	360 (SQS)	n/a
Bis(2-ethylhexyl)-phthalate	No	µg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	47 (mg/kg-OC)/ 710 (dw) (SQS)	n/a
Acenaphthene	No	µg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	16 (mg/kg-OC)/ 240 (dw) (SQS)	n/a

TABLE 12 (MARK UP)

Summary of Cleanup Levels for COCs in Sediment (Page 3 of 4)

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^{a,b}	RAO 1 Human Seafood Consumption ^{b,c} (0 to 10 cm)	RAO 2 Human Direct Contact ^{b,c} (0 to 45 cm)	RAO 3 Benthic Organisms ^{e,d} (0 to 10 cm)	RAO 4 Ecological ^{d,e} (0 to 10 cm)
Benzo(a)-anthracene	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	110 (mg/kg-OC)/ 1,700 (dw) (SQS)	n/a
Benzo(a)pyrene	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	99 (mg/kg-OC)/ 1,500 (dw) (SQS)	n/a
Benzo(g,h,i)-perylene	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	31 (mg/kg-OC)/ 470 (dw) (SQS)	n/a
Total Benzofluor-anthenes	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	230 (mg/kg-OC)/ 1,800 (SQS)	n/a
Chrysene	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	110 (mg/kg-OC)/ 1,700 (dw) (SQS)	n/a
Dibenz(a,h)-anthracene	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	12 (mg/kg-OC)/ 180 (dw) (SQS)	n/a
Fluoranthene	No	µg/kg dw	Sitewide Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	160 (mg/kg-OC)/ 2,400 (dw) (SQS)	n/a

TABLE 12 (MARK UP)

Summary of Cleanup Levels for COCs in Sediment (Page 4 of 4)

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Units ^a	Spatial Scale of Exposure ^{ab}	RAO 1 Human Seafood Consumption ^{b c} (0 to 10 cm)	RAO 2 Human Direct Contact ^{b c} (0 to 45 cm)	RAO 3 Benthic Organisms ^{c d} (0 to 10 cm)	RAO 4 Ecological ^{d e} (0 to 10 cm)
Indeno(1,2,3-cd)pyrene	No	µg/kg dw	Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
Phenanthrene	No	µg/kg dw	Point	n/a	n/a	34 (mg/kg-OC)/ 510 (dw)-(SQS)	n/a
			Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
Total HPAH	No	µg/kg dw	Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	100 (mg/kg-OC)/ 1,500 (dw) (SQS)	n/a
			Sitewide	n/a	n/a	n/a	n/a
			Subtidal	n/a	n/a	n/a	n/a
			Intertidal	n/a	n/a	n/a	n/a
			Point	n/a	n/a	960 (mg/kg-OC)/ 14,400 (dw) (SQS)	n/a

^a Unless noted differently in RAO-specific values^{ba} The spatial scale of exposure is measured as sitewide (i.e., all subtidal and intertidal sediments), intertidal sediments only, and point measurements at single locations throughout the site (i.e., all subtidal and intertidal sediment locations) or at single locations in intertidal sediment only. The spatial scale is RAO-specific, with sitewide exposures applicable to human seafood consumption, human direct contact, and exposures of fish and crab. Intertidal-only exposures are applicable to human consumption of clams from intertidal areas and exposures of sandpiper. Point exposures are applicable to benthic organisms, which are evaluated at single station locations. The statistical metric for sitewide and intertidal evaluation of alternatives and compliance monitoring is the upper confidence limit on the mean, whereas point exposures are evaluated with concentration data at single locations.^{cb} Cleanup levels are based on 10⁻⁶ cancer risk for carcinogens (e.g., PCBs, cPAHs, arsenic) or on a child exposure hazard quotient of 1 for noncarcinogens (lead, tributyltin, copper). Where Cleanup Levels are based on carcinogenic risks below background, the background concentration is selected; where no background values are available (chlordanes and DDT), the method detection limit (MDL) is selected.^{de} Applicable on a point exposure only. Values for PCBs and PAHs (except total benzofluoranthenes) are the organic carbon-normalized SQS and the dry weight equivalent based on an average sediment TOC content of 1.5%; for all other compounds values are dry weight. Under the SMS, sediment cleanup standards are established on a site-specific basis within an allowable range. The SQS and CSL define this range. For chemicals without SMS, LAET and 2LAET values or the SL and ML of the DMMP define this range.^{ed} Cleanup levels for sitewide exposure are the lowest for either fish or crab; Cleanup levels for intertidal exposure are for sandpiper

n/a = compounds do not present a risk for the RAO scenario.

mg/kg dw = milligrams per kilogram dry weight

mg/kg OC = milligrams per kilogram organic carbon

µg/kg dw = micrograms per kilogram dry weight

ng TEQ/kg dw = nanograms toxicity equivalents per kilogram dry weight

µg TEQ/kg dw = micrograms Toxicity Equivalents per kilogram dry weight

OC = Organic Carbon (1.5%)

Adapted from RI/FS Report Table 9-5 (TetraTech 2012)

TABLE 23 (MARK UP)

Summary of Compliance Zones and Cleanup Levels for COCs

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Total PCBs	Yes	Sitewide-Subtidal	0 to 10 cm	2	µg/kg dw	Natural background
		Intertidal	0 to 45 cm	2	µg/kg dw	Natural background
		Point	0 to 10 cm	12 180	µg -mg/kg OC µg/kg dw	SQS
cPAHs	Yes	Sitewide-Subtidal	0 to 10 cm	9	µg TEQ/kg dw	Natural background
		Intertidal	0 to 45 cm	9	µg TEQ/kg dw	Natural background
		Point	0 to 10 cm	-		
Arsenic	Yes	Sitewide-Subtidal	0 to 10 cm	7	mg/kg dw	Natural background
		Intertidal	0 to 45 cm	7	mg/kg dw	Natural background
		Point	0 to 10 cm	57	mg/kg dw	SQS
Lead	Yes	Sitewide-Subtidal	0 to 10 cm	11	mg/kg dw	Natural background
		Intertidal	0 to 45 cm	11	mg/kg dw	Natural background
		Point	0 to 10 cm	-		
Tributyltin	Yes	Sitewide-Subtidal	0 to 10 cm	150	mg/kg dw	RBTC – fish
		Intertidal	0 to 45 cm	2,000	mg/kg dw	RBTC – child
		Point	0 to 10 cm	-		
Copper	Yes	Sitewide-Subtidal	0 to 10 cm	400	mg/kg dw	RBTC – child
		Intertidal	0 to 45 cm	400	mg/kg dw	RBTC – child
		Point	0 to 10 cm	390	mg/kg dw	SQS and CSL
Mercury	Yes	Sitewide-Subtidal	0 to 10 cm	0.41	mg/kg dw	RBTC – child
		Intertidal	0 to 45 cm	0.17	mg/kg dw	RBTC – child
		Point	0 to 10 cm	0.41	mg/kg dw	SQS
Dioxins/Furans	Yes	Sitewide-Subtidal	0 to 10 cm	2	ng TEQ/kg dw	Natural background
		Intertidal	0 to 45 cm	2	ng TEQ/kg dw	Natural background
		Point	0 to 10 cm	-		
Antimony	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	150	mg/kg dw	SQS LAET/SL

TABLE 23 (MARK UP)

Summary of Compliance Zones and Cleanup Levels for COCs

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Cadmium	No	Sitewide-Subtidal	0 to 10 cm	0.398	mg/kg dw	RBTC Natural Background
		Intertidal	0 to 45 cm	0.398	mg/kg dw	RBTC Natural Background
		Point	0 to 10 cm	-		
Chromium	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	260	mg/kg dw	SQS
Cobalt	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	10	mg/kg dw	SQS LAET/SL
Nickel	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	140	mg/kg dw	SQS LAET/SL
Selenium	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	1	mg/kg dw	SQS LAET/SL
Vanadium	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	57	mg/kg dw	SQS LAET/SL
Zinc	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	410	mg/kg dw	SQS
Pentachlorophenol	No	Sitewide-Subtidal	0 to 10 cm	58	mg/kg dw	RBTC
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	360	µg/kg dw	SQS
Bis(2-ethylhexyl)-phthalate	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	47 710	µg -mg/kg OC µg/kg dw	SQS

TABLE 23 (MARK UP)

Summary of Compliance Zones and Cleanup Levels for COCs

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Acenaphthene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	16 240	µg-mg/kg OC µg/kg dw	SQS
Benzo(a)-anthracene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	110 1,700	µg-mg/kg OC µg/kg dw	SQS
Benzo(a)pyrene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	99 1,500	µg-mg/kg OC µg/kg dw	SQS
Benzo(g,h,i)-perylene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	31 470	µg-mg/kg OC µg/kg dw	SQS
Total Benzofluor-anthenes	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	230 1,800	µg-mg/kg OC µg/kg dw	SQS
Chrysene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	110 1,700	µg-mg/kg OC µg/kg dw	SQS
Dibenz(a,h)-anthracene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	12 180	µg-mg/kg OC µg/kg dw	SQS
Fluoranthene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	160 2,400	µg-mg/kg OC µg/kg dw	SQS

TABLE 23 (MARK UP)

Summary of Compliance Zones and Cleanup Levels for COCs

New text and values are indicated by bold font, deleted text and values are indicated by strike-through font

COC	Risk Driver?	Compliance Basis	Compliance Zone	Lowest Applicable Cleanup Level for Compliance Zone	Units	Source of Lowest Applicable Cleanup Level
Indeno(1,2,3-cd)pyrene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	34 510	µg -mg/kg OC µg/kg dw	SQS
Phenanthrene	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	100 1,500	µg -mg/kg OC µg/kg dw	SQS
Total HPAH	No	Sitewide-Subtidal	0 to 10 cm	-		
		Intertidal	0 to 45 cm	-		
		Point	0 to 10 cm	960 14,400	µg -mg/kg OC µg/kg dw	SQS

Notes:

- not a COC for compliance zone

cm = centimeter

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

CSL = cleanup screening level

LAET/SL = lowest apparent effects threshold/screening level

Nat Bkgd = natural background

PCBs = polychlorinated biphenyls

RAO = remedial action objective

RBTC = risk based threshold concentration

SQS = sediment quality standard

SWAC = spatially-weighted average concentration

mg/kg dw = milligrams per kilogram dry weight

µg/kg dw = micrograms per kilogram dry weight

ng TEQ/kg dw = nanograms toxicity equivalents per kilogram dry weight

µg TEQ/kg dw = micrograms Toxicity Equivalents per kilogram dry weight

OC = Organic Carbon (1.5%)

